The New York Times | https://nyti.ms/318qlSi

Rising Seas Could Menace Millions Beyond Shorelines, Study Finds

As climate change raises sea levels, storm surges and high tides will push farther inland, a team of researchers says.

By Brad Plumer

July 30, 2020

As global warming pushes up ocean levels around the world, scientists have long warned that many low-lying coastal areas will become permanently submerged.

But a new study published Thursday finds that much of the economic harm from sea-level rise this century is likely to come from an additional threat that will arrive even faster: As oceans rise, powerful coastal storms, crashing waves and extreme high tides will be able to reach farther inland, putting tens of millions more people and trillions of dollars in assets worldwide at risk of periodic flooding.

The study, published in the journal Scientific Reports, calculated that up to 171 million people living today face at least some risk of coastal flooding from extreme high tides or storm surges, created when strong winds from hurricanes or other storms pile up ocean water and push it onshore. While many people are currently protected by sea walls or other defenses, such as those in the Netherlands, not everyone is.

If the world's nations keep emitting greenhouse gases, and sea levels rise just 1 to 2 more feet, the amount of coastal land at risk of flooding would increase by roughly one-third, the research said. In 2050, up to 204 million people currently living along the coasts would face flooding risks. By 2100, that rises to as many as 253 million people under a moderate emissions scenario known as RCP4.5. (The actual number of people at risk may vary, since the researchers did not try to predict future coastal population changes.)

"Even though average sea levels rise relatively slowly, we found that these other flooding risks like high tides, storm surge and breaking waves will become much more frequent and more intense," said Ebru Kirezci, a doctoral candidate at the University of Melbourne in Australia and lead author of the study. "Those are important to consider."

Areas at particular risk include North Carolina, Virginia and Maryland in the United States, northern France and northern Germany, the southeastern coast of China, Bangladesh, and the Indian states of West Bengal and Gujarat.

This flooding could cause serious economic damage. The study found that people currently living in areas at risk from a 3-foot rise in sea levels owned $14 trillion in assets in 2011, an amount equal to 20 percent of global G.D.P. that year.

The authors acknowledge that theirs is a highly imperfect estimate of the potential costs of sea-level rise. For one, they don't factor in the likelihood that communities will take action to protect themselves, such as elevating their homes, building sea walls or retreating inland.

The study also did not account for any valuable infrastructure, such as roads or factories, that sits in harm's way. A fuller economic accounting would require further research, Ms. Kireczi said.

CLIMATE FWD: *What on earth is going on? Get the latest news about climate change, plus tips on how you can help.*

Sign Up

There are already signs that periodic flooding is wreaking havoc along coastlines. A July analysis from the National Oceanic and Atmospheric Administration found that high-tide flooding in cities along the Atlantic and Gulf Coast has increased fivefold since 2000, a shift that is damaging homes, imperiling drinking-water supplies and inundating roads.

The new study tries to improve projections of future coastal flooding risk by combining existing models of sea-level rise, tides, waves, storm surges and coastal topography, while checking those models against data gathered from tidal gauges around the world. Past research, Ms. Kirezci said, had not looked in such detail at factors like breaking waves that can temporarily lift local sea levels.

“Trying to model extreme sea levels and storm surge is an extremely complicated problem and there are still lots of uncertainties,” said Michael Oppenheimer, a climate scientist at Princeton University who was not involved in the study. But, he said, it was critical for scientists to develop good estimates, because if cities like Boston or New York hope to build costly new storm surge barriers or other defenses, they’ll need to plan decades before higher sea levels arrive.

The new study found that only one-third of future coastal flooding risk came from rising sea levels that would permanently submerge low-lying areas. Two-thirds of the risk came from a likely increase in extreme high tides, storm surges and breaking waves. In many coastal areas, the type of rare flooding that historically occurred once every 100 years, on average, could occur every 10 years or less by the end of the century.

Scientists say the world’s nations can greatly reduce future flooding risks by cutting emissions rapidly, especially since that could lower the odds of rapid ice-sheet collapse in Antarctica that would push up ocean levels even higher than forecast later in the century.

But, Dr. Oppenheimer added, the world has now warmed so much that significant sea-level rise by 2050 is assured no matter what happens with emissions. “That means we also need to start preparing to adapt now,” he said.